MODELS

ESA Building Blocks	
RA4100 (rack)	146013-001
RA4100 Rack to Tower Conversion Kit	154253-B21
RA4000 Redundant Controller	223187-B21
FC-AL Switch 8	177862-B21
FC-AL Switch 3 Port Expansion Module	177863-B21
FC Switch 8 - EL	176219-B21
Fibre Channel SAN Switch 8-EL - Bundle	253723-001
FC Switch 16 - EL	212776-B21
Fibre Channel SAN Switch 16-EL - Bundle	253740-001
SAN Switch 8	158222-B21
Fibre Channel SAN Switch/8 (supports Quickloop) - Bundle	253704-001
SAN Switch 16	158223-B21
Fibre Channel SAN Switch/16 (supports Quickloop) - Bundle	253705-001
Fibre Channel Storage Hub 7	234453-001
Fibre Channel Storage Hub-7 Rack Mounting Kit	136127-B21
Fibre Channel Storage Hub 12	295573-001
64-bit/66-MHz Fibre Channel Host Adapter	120186-B21
Redundant Host Adapter Failover Software Kit for Windows NT (single server, dual path)	174681-B21
High Availability F100 Cluster (HA/F100) Kit for NT 4.0 and Windows 2000 (dual server, single path)	309816-B21
High Availability F200 Cluster (HA/F200) Kit for NT 4.0 and Windows 2000 (dual server, dual path)	380357-B23
High Availability F200 Cluster (HA/F200) UPGRADE Kit for NT 4.0 and Windows 2000	176848-B22
Secure Path for Windows 2000 (single server, dual path)	213076-B21
Secure Path for NetWare	
NetWare N100 Cluster Kit Single Path	219142-B21
NetWare N200 Cluster Kit Dual Path	219143-B21

This innovative SAN solution from Compaq delivers the best integration of scalability, capacity and price/performance for Compaq ProLiant™ servers, ProLiant clusters, and Multi-platform X86 servers. The RA4100 can scale from several GB to over 6.0TB per server slot (using 36 GB drives) allowing you to purchase the storage capacity you need today and feel confident that you have enough bandwidth to easily expand in the future.

What is Storage Services Bundling?

The Storage Services Bundling takes the existing storage products along with the existing services and creates bundles of storage hardware/software and appropriate services. The increased level of support provides for a higher level of storage system availability for the customer.

COMPAQ

OVERVIEW

RAID Array 4100

The Compaq *StorageWorks*™ RAID Array 4100 is an external fibre channel storage product that has won numerous awards and industry accolades for outstanding scalability, flexibility and connectivity. Compaq offers Multi-platform Intel-based server support to the RA4100 to allow a broad range of Intel-based servers to take advantage of the RA4100's scalability, flexibility and connectivity. The RA4100 utilizes the new "universal" drive carrier and will support a maximum of twelve, 1″ Ultra2 or Ultra3 hard drives in a single enclosure. With increasing storage growth and investments, customers are demanding "simple" and easy to manage storage solutions, that simplify deployment and management, and above all, lower total cost of ownership (TCO). Now, Compaq customers can buy hard disk drives for their entire enterprise, from departmental servers up to the data center, without the confusion of disk and drive tray incompatibilities! The 4100 is an external storage system that is ideal for *ProLiant* Clusters, databases, data marts, Web servers, server consolidation, e-mail and other applications that require scalability and bandwidth for growing storage needs. The RA4100 is the storage subsystem used in Compaq's entry-level Microsoft Clustering product, the *ProLiant* Cluster HA/F200, providing industry-leading price/performance. The RA4000 Redundant Controller can be added to existing RA4100 units.

StorageWorks RA4100 SAN Solution - Enhanced

Compaq's **StorageWorks RA4100 SAN Solution**, the ultimate entry level SAN targeted towards departmental deployments, just got better. This key solution will simplify storage management, manage explosive data growth, and reduce business down time. Delivering the ultimate storage consolidation solution for heterogeneous x86 departmental and workgroup environments, this solution now offers added fabric switch support, Windows 2000 redundancy support, and interconnect cascading for larger SAN deployments. Whether it be *ProLiant* or other industry standard servers, users can simultaneously deploy distributed business applications running in a mixture of Windows NT, Windows 2000, NetWare, and Linux Operating Systems.

- **Storage consolidation with primary and secondary storage on the same SAN** – Now IT Managers can use ANY Compaq *StorageWorks* Fabric Switch or the Compaq *StorageWorks* FC-AL Switch 8 as the cornerstone of SAN deployments. Compaq *StorageWorks* Switches provide the ability to combine primary storage components such as the RA4100 or RA4000 storage systems and secondary storage components such the Compaq Enterprise Backup Solution (EBS) utilizing Tape Libraries (TL891/MSL5026/TL895/SSL 2020) on the same SAN.
- ***NEW* – High Availability/Clustering** – With true heterogeneous OS support and added support for multiple, heterogeneous clusters on the same SAN, customers can be assured they can adapt this solution as their computing environments and needs change. Added Fabric switch support ensures future storage growth and the resulting infrastructure requirements can be supported with the investments made today.
- **Shared storage made simple** – Selective Storage Presentation firmware allows administrators to dynamically allocate and control access to storage pools down to the logical volume level.
- ***NEW* – Increased Interconnect Support** – RA4100 solutions now support the FC-AL Switch 8 as well as Compaq fabric switches (FC Switch 8 EL, FC Switch 16 EL, SAN Switch 8, SAN Switch 16). Furthermore, you can now cascade the FC-AL Switch to another FC-AL Switch (I hop maximum), you can cascade an FC-AL Switch to a Compaq fabric switch (I hop maximum), and you can also cascade the Compaq fabric switch to another Compaq fabric switch (1 hop). Please refer to compatibility matrix for complete configuration support.
- **Affordable growth** – As your connection needs grow, the 8-port *StorageWorks* FC-AL Switch 8 can be expanded to 11 ports using the *StorageWorks* FC-AL Switch 3-Port Expansion Module. Compaq's FC Switch 8-EL provides a low cost fabric solution. Either are ideal to reduce costs in departmental or "edge" SAN deployments, while connecting to the fabric backbones often found in Enterprise environments
- **Dedicated Bandwidth** – Whether it be a FC-AL switch or a fabric switch, users benefit from dedicated, non-blocking 100MB/sec point-point parallel connections.

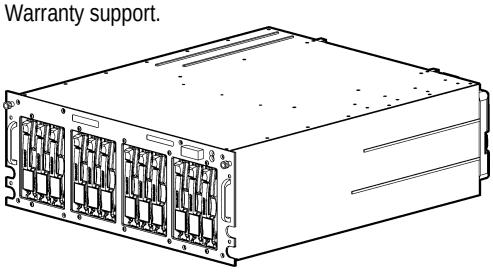
Interconnect	Maximum Bandwidth
Hub 7	100 MB/s
Hub 12	100 MB/s
FC-AL Switch	500 MB/s
SAN Switch 8/8-EL	800 MB/s
SAN Switch 16/16-EL	1600 MB/s

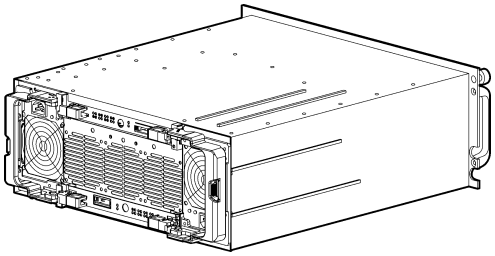
- **Solution management made easy** – With management and configuration tools such as StorageWorks Command Console (SWCC), Compaq Insight Manager XE, Array Configuration Utility (ACU), and the StorageWorks Switch Management Utility, you can use the tools already in place today.

OVERVIEW *(continued)*

Multi-platform Intel-based Server Support

Compaq provides the unparalleled scalability, flexibility and connectivity benefits of the RA4100 to Intel-based servers. When used in an Intel-based server running Microsoft Windows NT 4.0, Windows 2000, Novell Netware 5.1, and Linux, the RA4100 provides high availability, through redundant power supplies, fans, controllers and host adapters; flexibility, through the use of Fibre Channel based protocols; and connectivity, through a fabric or loop-based architecture. When used with a Compaq *ProLiant* server, the RA4100 also provides unparalleled integration with Insight Manager, Smart Start, and Pre-Failure Warranty support.





Fibre Channel Technology

Fibre Channel is an industry-standard interconnect and high-performance serial I/O protocol that shatters the limitations of data transmission, storage capacity, and cabling distances associated with SCSI. The RA4100 uses Fibre Channel technology and a modular design to deliver a highly scalable, reliable, standards-based storage solution for explosive growth in the enterprise. The system integrates seamlessly into your Compaq *ProLiant* server environment while protecting your SCSI HDD investment. For additional availability, Compaq has partnered with Microsoft and Novell to integrate support for clustering.

The Smart Array Advantage

As an extension to the Smart Array controller product line, the RA4000 Controller delivers the benefits that you have come to expect from Compaq RAID products.

Data Compatibility between generations of controllers means customers can upgrade from previous generation Smart Array products to get to higher performance, capacity and availability. Unlike competitive products, successive generations of Smart Array products understand the data format of other Smart Array controllers.
(Please refer to the compatibility matrix for complete configuration support.)

Consistent Configuration and Management Tools. All Smart Array products utilize a standard set of management and utility software. These tools consistently lower the cost of ownership by reducing training and technical expertise necessary to install and maintain the Compaq server storage. Configuration, management and diagnostic software tools includes: Array Configuration Utility, Array Diagnostic Utility, Compaq Insight Manager (CIM), Compaq Insight Manager XE, and Compaq SmartStart.

Snap Shot Backup and Restore. Compaq delivers the next step towards the Enterprise Network Storage Architecture vision with support for Compaq SANworks Virtual Replicator. With this optional software, users can instantly create "snapshots" of production data to reduce backup and restore windows from hours to minutes, pool storage for quick response to changing storage capacity needs, create "virtual volumes" of up to one terabyte and enjoy policy-based automation to simplify system data and storage management. Compaq SANworks Virtual Replicator is available via the web site as a downloadable 60 live trial version.

RA4100 Components

With the following components, your storage capacity and performance can be scaled to new levels:

RAID Array 4100 Rack*:* Houses up to 12, 1-inch hot pluggable drives. Each array includes the RA4000 Controller, an integrated RAID controller based on Compaq's 6th generation Smart Array technology, with 64-MB (16-MB read, 48-MB user selectable read/write battery-backed) cache, a 2 meter Multi-Mode Fibre Channel Cable and GBIC-SW Kit to link your storage to the FC- interconnect**.**

RA4000 Redundant Controller: Based on Compaq's sixth generation RAID technology, this redundant array controller adds a higher level of availability not found previously in Compaq storage systems. Using this redundant controller requires software found on SmartStart 4.3 or later (for Novell Netware or Microsoft Windows NT 4.0) and in the Compaq *ProLiant* Cluster HA/F200 Kit (for both non-clustered Microsoft Windows 2000 and Microsoft Windows NT Cluster Server). Clustered Novell Netware environments will be supported in SmartStart 4.4. Utilizing technology developed for our SMART-2 family of array controllers, the RA4000 Redundant Controller fully supports Array Configuration Utility, Compaq Insight Manager, Pre-Failure Warranty, and Fibre Channel Host Adapter failover.

Choosing the right Fibre Channel interconnect*:* Choose a hub if deploying a standalone server or cluster. Choose a switch if deploying a multiple non-cooperating server or cluster or integrated EBS SAN.

OVERVIEW *(continued)*

RA4100 Components *(continued)*

FC-AL Switch 8: This is an 8-port, 12 Gigabit/second, non-blocking FC-AL Switch that is the core interconnect that enables an affordable RA4100 SAN solution. As your connectivity needs grow the FC-AL Switch 8 can be expanded to a total of 11-ports using the FC-AL Switch 3-Port Expansion Module.

SAN Switch 8 – EL: The Fibre Channel SAN Switch 8-EL has all the high performance functionality of Compaq's 8 port SAN switch with a few less of the high-availability features in a cost reduced, entry level full fabric switch. One port is also configurable as E-ports for switch-to-switch connectivity. This switch has 7 fixed short-wave media ports and one configurable GBIC port.

SAN Switch 16- EL: The Compaq *StorageWorks* Fibre Channel SAN Switch/16-EL is an entry level, scalable, full fabric switch. Each of the sixteen ports is capable of accepting long or short wave GBICs. In price point, high-availability features, and functionality it is positioned below the Compaq SAN Switch 16 for the price sensitive customer looking for the market leader in price/performance.

SAN Switch 8:Same features as the SAN Switch 8-EL with additional high-availability attributes as redundant, hot-plug fans and optional power supply. All 8 ports are hot-plug GBIC based and can serve as E-ports.

SAN Switch 16: For customers who demand the highest performance, full fabric switch with the highest availability, the answer is the SAN Switch 16. It has all of the features of the SAN Switch 16-EL with the addition of hot-plug fans, optional redundant power supply's, and a management-menu display. Also supports QuickLoop.

***Fibre Channel Storage Hub 7*:** This is a non-intelligent, unmanaged Storage Hub, which attaches multiple RA4100s to a single ProLiant (or two node NT/Win2K cluster) or x86 server (standalone only) the Fibre Channel Host Adapter for support of up to seventy-two 1-inch hard drives per server slot. Compaq recommends the Fibre Channel Storage Hub 7 for smaller configurations because it provides the best value.

Fibre Channel Storage Hub 12: This is an intelligent, managed Storage Hub which attaches up to 11 RA4100s to the Fibre Channel Host Adapter for support of up to one hundred thirty-two 1-inch hard drives per server slot.

Fibre Channel Host Adapters: PCI Fibre Channel Host Adapters operating at either 64-bit/66-MHz or 32-bit/33-MHz are the link between your Compaq *ProLiant* or Intel-based non-Compaq server and the RA4100.

Gigabit Interface Converters Kits *(GBIC-SW and GBIC-LW)**:*** Compaq designed these industry-standard connection devices which hot plug into Fibre Channel hubs, array controllers, and host adapters. These converters provide expansion ease and 100 MB/s performance. GBIC-SW modules support distances of up to 500 meters using multi-mode fiber optic cable and GBIC-LW modules support distances of up to 10 kilometers or over 6 miles using single-mode optical fiber.

Multi-Mode Fibre Channel Cables: 2, 5, 15, 30 and 50 meter cables provide a thin, flexible cabling solution between GBICs, and are immune to electromagnetic interference.

Redundant Host Adapter Failover Software Kit for Windows NT: This software kit includes all necessary drivers and documentation to configure and enable host adapter failover for Microsoft Windows NT 4.0.
Note: Secure Path 3.1a for RA4100 is required for Microsoft Windows 2000 failover support. Secure Path 3.0 for RA4100 is required for Novell NetWare failover support.

Scalability

Capacity, cache, memory and processing power scale simultaneously as you add RA4100s, allowing you to purchase storage for your current needs while providing enough bandwidth and flexibility for substantial growth in the future.

Fault Tolerance

Keeps data available and server running while drive is being replaced; several fault tolerance configurations are supported including:

Distributed Data Guarding (RAID 5): Allocates parity data across multiple drives and allows simultaneous write operations.

Data Guarding (RAID 4): Writes parity data to a single, designated drive.

Drive Mirroring (RAID 1, 0+1): Allocates half of the drive array to data and the other half to mirrored data, providing two copies of every file.

Capacity

Per Array: Using 36.4-GB drives; a single RA4100 can scale up to 436.8 GB.

Per Loop: Add a Fibre Channel Storage Hub 12 and scale up to 4.8 TB per server slot.

Per Switch: Add a SAN switch 16 and scale up to 6.5 TB per server slot.

OVERVIEW *(continued)*

Fault Recovery

Minimizes downtime, reconstructs data, and facilitates a quick recovery from drive failure

On-Line Spares: Up to four spare drives can be installed prior to drive failure. If a failure occurs, recovery begins with an on-line spare and data is reconstructed automatically.

Array Accelerator: Onboard, battery-backed cache memory protects data in the event of a power failure. This daughter board is uniquely removable from the array in the unlikely event of a controller failure—saving critical user data for up to four days.

High Availability

Saves training and administration costs by providing online storage management tools:

Microsoft Windows 2000 Advanced Server, Microsoft NT Server 4.0, Enterprise Edition, Novell NetWare High Availability Server and Oracle Parallel Server: Compaq was the first company to deliver support for Microsoft Cluster Server (MSCS) on Fibre Channel attached storage and has been a leader in storage solutions for Novell NetWare High Availability Server. In addition, Compaq also supports Oracle Parallel Server with the RA4100 and RA4100 SAN Solution. Please note: Microsoft Windows 2000 cluster support now available!!! (Please refer to the compatibility matrix for complete configuration support.)

Multiple, Heterogeneous Cluster Support on the same SAN: With the latest updates, the RA4100 SAN Solution now supports up to 5 clusters on the same SAN. These clusters can also be a mixture of MSCS, NWCS and OPS. Note: The existing requirement that each cluster must have a dedicated RA4100 and that an RA4100 cannot be shared by more than 1 cluster still applies. (Please refer to the compatibility matrix for complete configuration support)

Integrated Configuration Features

Selective Storage Presentation: allows RA4100 array sets to be partitioned to multiple servers for SAN access

Online RAID Level Migration: allows for online post-configuration change to RAID level without destroying data or volume information.

Online Capacity Expansion: lets you add storage to an operational RA4100—reducing expensive server downtime.

Online Volume Extension: allows for the capacity growth of existing logical volumes.

Global Online Spare: reduces the risk of data loss by facilitating automatic rebuilds after a drive failure.

Logical Drive Capacity Extension: allows the user to increase the size of existing logical drives online under Windows NT and offline for other operating systems.

Pre-Failure Warranty: Drives installed in an RA4100 and monitored under Compaq Insight Manager are supported by a Pre-Failure (replacement) Warranty.

Note: Pre-Failure Warranty allows for the replacement of designated drives in an RA4100 before they actually fail when using Compaq Insight Manger on Compaq servers.

Note: Some operating systems may not support all of these features.

Compaq *SANworks* Virtual Replicator *(SWVR)*

Snapshots. Using SWVR, instantly create "virtual copies" of production data to reduce backup and restore windows from hours to minutes.

Dynamic Growth. For quick response to changing storage capacity needs, create "virtual volumes" of up to two terabytes with SWVR and enjoy policy-based automation to simplify system data and storage administration.

The software part number (388931-001) is optional and can be ordered by contacting your local Compaq sales office or you can download a 60-day live trial version of the software from the web site. System requirements for the software are Windows NT 4.0 SP3, IE 3.02, 32-MB memory, and 30 MB disk space.

Compaq Integration

Both the Compaq RA4000 and RA4100 were designed and integrated specifically for use with Compaq *ProLiant* servers, hard drives and RAID systems, so you can be confident that it will integrate seamlessly into your Compaq Server environment.

OVERVIEW *(continued)*

Multi-platform X86-based Server Support

When used in an Intel-based server running Microsoft Windows 2000 Advanced Server Edition, Microsoft Windows NT 4.0, Novell Netware 5.1, and Linux, the RA4100 provides high availability, through redundant power supplies, fans, controllers (NT and Netware only), and host adapters; flexibility, through the use of Fibre Channel based protocols; and connectivity, through a fabric or loop-based architecture. When used with a Compaq *ProLiant* server, the RA4100 also provides unparalleled integration with Compaq Insight Manager, Smart Start, and Pre-Failure Warranty support.

Hot Pluggable Support

RA4000 Controller supports hot pluggable drives for simple installation and maintenance. In addition, drives are covered by Compaq's Pre-Failure Warranty. Compaq Insight Manager will notify you of a potential drive failure before it happens, so that the drive may be replaced.

Note: Pre-Failure Warranty allows for the replacement of designated drives in an RA4100 before they actually fail when using Compaq Insight Manager on Compaq servers.

Easy Installation

Multi-mode fiber optic cables, which are less bulky than SCSI cables, simplify installation. Distances of up to 500 meters between your server and storage systems are supported on 50-micron, multi-mode, fiber optic cable (200 meters on 62.5-micron multi-mode fiber optic cable). For even greater distances, 9-micron single mode fibre optic cable can be used to achieve 10-kilometer distances between RA4000 family components. In addition, integration with the Compaq Array Configuration Utility and SmartStart ensures quick and easy storage configuration.

Note: For more information about cabling and installation, refer to http://compaq.com/support/techpubs/whitepapers/ecg0030298.html

Low Total Cost of Ownership

You can buy what you need today and purchase additional capacity and performance as your information grows, instead of making a large up-front investment. More storage systems, controllers and expansion modules can be easily added as your needs dictate. Also, because the arrays support SCSI drives, your investment in SCSI technology is protected and cost is minimized as you add new drives.

Sharing of a common universal drive form factor between your server, external storage enclosures, and fibre channel array can significantly reduce needs for hardware and spare inventory, and offer overall reduction in storage management and business costs.

RA4100 SAN Maximum/Minimum Configurations

Interconnect	*Max server/Min RA4100*	*Max number of clusters*	*Max RA4100s/Min servers*
FC-AL Switch 8	6 servers / 1 RA4100	MS – 3 2-node	6 RA4100s / 1 server
FC-AL Switch 11	8 servers / 1 RA4100	MS – 3 2-node, Netware 1 8-node	9 RA4100s / 1 server
SAN Switch 8/8-EL	6 servers / 1 RA4100	MS – 3 2-node	6 RA4100s / 1 server
SAN Switch 16/16-EL	10 servers / 1 RA4100	MS – 5 2-node, Netware 1 8-node	14 RA4100s / 1 server (non-cluster environment) 9 RA4100s/1 server (cluster environment)

* Configuration Maximums double with the cascade of an interconnect device to a second interconnect device. Please refer to the compatibility matrix for complete configuration support.

SOFTWARE COMPONENTS

Compaq server storage and Smart Array software makes setup storage management, configuration and trouble-shooting a breeze. Compaq server storage and Smart Array products utilize a single, consistent set of utility software for storage and RAID management. This consistency across the Smart Array product line reduces the cost of ownership by reducing the training and technical expertise necessary to install and maintain your Compaq server storage solution.

Array Configuration Utility & Array Diagnostic Utility

Powerful configuration and diagnostic utilities for all Smart Array controllers

Provides a graphical view of Compaq drive array configurations

Easy to use Wizards for configuration

Runs online on Microsoft Windows NT 4.0, Microsoft Windows 2000, and Novell NetWare

Selective Storage Presentation

Allows setting of access rights to RA4000/RA4100 storage by host and or/cluster.

Access Control can be set up to a logical volume level using Array Controller Utility (ACU)

Built-in to RA4000 controller firmware. Upgrades possible through SmartStart CD Version 4.8 for older RA4000 controllers.

SOFTWARE COMPONENTS *(continued)*

Compaq Insight Manager

Powerful server and server options/storage manager tool

Monitors over 1,200 different server parameters

SmartStart

Simple to use server and storage installation tools

Redundant Host Adapter Failover Software (separate option kit required)

Support dual host adapters and dual fibre loops

OS Support

Microsoft Windows NT 4.0 (sp6)

Microsoft Windows 2000 Advanced Server

Novell NetWare (5.1)

Linux (Redhat, Caldera, Turbo, VA)

Please refer to compatibility matrix for complete configuration support.

Software Certifications

Microsoft Cluster Server Certification

Novell High Availability Server Certification

Novell Cluster Services Certification

Oracle Parallel Server Certification

Please refer to compatibility matrix for complete configuration support.

Warranty

Three-year, on-site Limited Warranty for RA4100s, Fibre Channel Cables and GBIC-SW; the greater of one-year Limited Warranty or the remaining Server Warranty for Fibre Channel Host Adapters.

SERVICE & SUPPORT, CAREPAQ AND WARRANTY INFORMATION

Software Product Services

- Standalone telephone support
- Rights to new license version
- Media and documentation updates

Hardware Product Services

- Installation services
- On-site maintenance (includes warranty support)
- Response time upgrades during the warranty period
- Post-warranty coverage

RAID setup and performance consulting via statement of work

Warranty Upgrade Options

- Response - Upgrade on-site response from next business day to same day 4 hours
- Coverage - Extend hours of coverage from 9 hours x 5 days to 24 hours x 7 days
- Duration – Select duration of coverage for a period of 1, 3, or 5 years

CarePAQ Information

Sample part numbers:

- FM-FCXHW-36, 3 year, uplift to 5 x 9, Next Day Response
- FM-FC4HR-36, 3 year, uplift to 5 x 9, 4-hour Response
- FM-FC724-36, 3 year, uplift to 7 x 24, 4-hour Response

- CarePAQ is defined as an upgrade to the product warranty attribute, available for a specific duration and hours of coverage.
- CarePAQ is not available for less than the product's warranty duration.
- CarePAQ is available for sale anytime during the warranty period for most products, but the commencement date will be the same as the Warranty Start Date (delivery date to end user customer). Proof of purchase may be required.
- CarePAQ services are prepaid.

For additional CarePAQ (hardware & software) information, as well as orderable part numbers, please refer to the URL listed below:

http://www.compaq.com/services/carepaq/index.html

Components

The following brick level options/components do not have individual CarePAQs. These items will be included in product CarePAQs into which they are installed.

Disk Drives	Tape Drives	CD/DVD ROM	SCSI Hubs in SBBs	Adapters
Bus Converters	Backplane RAID Controllers	Power Supplies	Cabling	Fans

What is Storage Services Bundling?

The Storage Services Bundling takes the existing storage products along with the existing services and creates bundles of storage hardware/software and appropriate services. The increased level of support provides for a higher level of storage system availability for the customer.

SPECIFICATIONS

RAID Array 4100	**Dimensions** (HxWxD)	Rack	6.9 x 22.9 x 19 in/175 x 582 x 483 mm
	Weight	Rack	33.58 lbs/15.5 kg
	LED Indicators on Front Panel (2)	Power, Service Required	
	LED Indicators for Drive Modules	Drive Access (center) Online (left) Drive Failure (right)	
	LED Indicators on Rear Panel	Fan Module (fault) Power Supply (online and fault status)	
	Interface	Wide-Ultra SCSI-3, Fast-Wide SCSI-2 or Fast SCSI-2	
	Maximum Number of Drives	1-inch Drives	12
	Temperature Range	Operating Shipping	50° to 86°F/10° to 35°C –20° to 140°F/–30° to 60°C
	Relative Humidity	Operating Non-operating	20% to 80% 5% to 90%
	Input Requirements	Nominal Line Voltage Range Line Voltage Line Frequency Typical Input Current	110 to 120 VAC/220 to 240 VAC 90 to 264 VAC 47 to 63 Hz 2.5 A at 120 VAC
	Power (Watts) (The RA4100 Array ships standard with a redundant power supply.)	Output Power	350 Watts per supply
	Power Supply Weight	7.34 lbs	
RAID Array 4000 Controller	**Protocol**	Fibre Channel Arbitrated Loop to Wide-Ultra SCSI-3, Fast-Wide SCSI-2 or Fast SCSI-2	
	LED Indicators on Rear Panel by GBIC Slot	GBIC Transmit Status, GBIC Receive Status	
	Drive Interface	Electrical Drive Transfer Channels Total Transfer Rate	Single-ended 2 simultaneous 80 MB/s (40 MB/s per channel)
	Drives Supported	Up to six Wide Ultra2 Universal Hard Drives	
	Data Transfer Method	SCSI over FC-AL	
	Maximum Transfer Rate (on Fibre Channel Arbitrated Loop)	100 MB/s	
	Software Upgradable Firmware	Yes	
	Cache	64 MB total. 16 MB ECC protected read + 48-MB battery-backed ECC protected and corrected user selectable read/write	
	Logical Drives Supported	32 (8 on MS NT)	
	Reliability Features	Distributed Data Guarding (RAID 5) Data Guarding (RAID 4) Drive Mirroring (RAID 1) Data Striping (RAID 0) RAID 0+1 Automatic Data Recovery	Yes Yes Yes Yes Yes Yes

SPECIFICATIONS *(continued)*

***StorageWorks* SAN Switch 8-EL Technical Specifications**	**Aggregate Bandwidth**	800 MB/s
	Operation Modes	Fibre Channel Class 2 and 3 connectionless service
	Data Transfer Latency	< 2µ sec with no contention
	Number of expansion slots	N/A
Switch Management Specifications	**Protocols Supported**	Telnet, SNMP, SWCC Web Based Management Tools
	Switch Management Access	Ethernet (RJ-45, 10/100 Base TX UTP) Serial port, In-band Fibre Channel Link
Physical Characteristics and Ordering Information	**Packaging**	Compaq *StorageWorks* Fibre Channel SAN Switch 8-EL
	Dimensions	1.7 x 16.87 x 10 in/ 43.4 x 428.6 x 254 mm
	Weight	10 lbs./4.54 kg
	Relative Humidity	5% to 85% non-condensing @ 104° F/40° C
	Power	100 to 240 VAC nominal, 47 to 63 Hz
***StorageWorks* SAN Switch 16-EL Technical Specifications**	**Aggregate Bandwidth**	1600 MB/s
	Operation Modes	Fibre Channel Class 2 and 3 connectionless service
	Data Transfer Latency	< 2µ sec with no contention
	Number of Expansion Slots	N/A
Switch Management Specifications	**Switch Management access**	Telnet, SNMP, SWCC Web Based Management Tools
		Ethernet (RJ-45, 10/100 Base TX UTP), Serial port, in-band Fibre Channel link
Physical Characteristics and Ordering Information	**Packaging**	Compaq *StorageWorks* Fibre Channel SAN Switch 16-EL
	Dimensions	2.57 x 16.87 x 17.71 in/ 65.2 x 428.6 x 450 mm
	Weight	17 lbs./7.7 kg
	Weight (with rails)	23 lbs/10.45 kg
	Relative Humidity	5% to 85% non-condensing @ 104° F/40° C
	Supported Power Range	85 to 265 VAC, 47 to 63 Hz
***StorageWorks* Fibre Channel SAN Switch 8 and 16 Technical Specifications**	**Aggregate Bandwidth**	800 and 1600 MB/s respectively
	Operation Modes	Fibre Channel Class 2 and 3 connectionless service
	Data Transfer Latency	< 2µ sec with no contention
Switch Management Specifications	**Switch management access**	Telnet, SNMP, SWCC Web based management tools
Physical Characteristics	**Packaging**	Compaq *StorageWorks* Fibre Channel SAN Switch 8 and 16
	Dimensions	SAN Switch 8: 1.7 x 16.87 x 17.71 in/ 43.4 x 428.6 x 450 mm SAN Switch 16: 3.44 x 16.87 x 17.71 in/ 87.3 x 428.6 x 450 mm
	Weight	SAN Switch 8: 14 lbs/6.36 kg SAN Switch 16: 25.6 lbs/11.59 kg
	Supported Power Range	100 to 240 VAC nominal, 47 to 63 Hz
***StorageWorks* FC-AL Switch Technical Specifications**	**Aggregate Bandwidth**	500 MB/s
	Communication Modes	Full Duplex
	Data Transfer Latency	< 280 - 500 nanosecond range
	Number of Expansion Slots	One 3-Port Expansion Module (for 8-port to 11-port expansion)
	Protocols Supported	FC-AL, FC-AL-2, FC-PH, FC-PH-2, FC-PH-3, FC-PLDA, FCP

SPECIFICATIONS *(continued)*

Switch Management Specifications	**Switch Management Access**	Local Console Via RS232, SNMP via 10BaseT	
	Switch Management Interface	ASCII via RS232, SNMP via 10baseT, *StorageWorks* Command Console (SWCC), Compaq Insight Manager (CIM) and CIM XE, *StorageWorks* FC-AL Switch Management Utility and Fibre Channel SAN Switch Management Utility	
	Management Standards	IETF Fibre Channel Management MIB, Fabric Element MIB	
Physical Characteristics and Ordering Information	**Packaging**	SW FC-AL Switch 8 (Part No. 177862-B21) SW FC-AL Switch 3-Port Expansion Module (Part No. 177863-B21)	
	Dimensions (HxWxD)	(Applies to 8-port and 11-port chassis)	1.66 x 17.3 x 16.26 in/ 42 x 439 x 413 mm
	Weight	8 port Chassis 3 port Expansion Module	24.9 lbs/11.2 kg 2.1 lbs/0.95 kg
	Relative Humidity (non-condensing)	Operating Shipping	20% to 80% non-condensing
	Power	100-240 VAC, 50-60 Hz	
	Power Supply	1.5A, 100 W, Fixed	
	Temperature Range	Operating Shipping	50°F to 140° F/10°C to 60° C –22°F to 140° F/–30°C to 60° C
Fibre Channel Storage Hub 7	**Dimensions** (HxWxD)	1.69 x 8.6 x 14.75 in/43 x 218 x 375 mm	
	Weight	6 lbs/2.7 kg	
	Media Interface	Short or long wave, optical, hot pluggable	
	Maximum Number of Devices/Ports	Seven	
	LED Indicators on Front Panel	GBIC status (green) Port Fault/Bypass (amber)	
	Temperature	Operating	32° to 132° F/0° to 50° C
	Relative Humidity (non-condensing)	5% to 95%	
	Input Requirements	Range Line Voltage Line Frequency	100 to 250 VAC 50 to 60 Hz
	Power (Watts)	All ports empty All ports in use at 251 mA each	25 Watts 35 Watts
Fibre Channel Storage Hub 12	**Dimensions** (HxWxD)	1.66 x 17.1 x 17.2 in/ 42 x 434 x 437 mm	
	Weight	10.5 lbs/4.8 Kg	
	Media Interface	Short or long wave, optical, hot pluggable	
	Maximum Number of Devices/Ports	12	
	LED Indicators on Front Panel	GBIC status (green) Port Fault/Bypass (amber)	
	Temperature	Operating	32° to 132° F/0° to 50° C
	Relative Humidity (non-condensing)	5% to 95%	
	Input Requirements	Range Line Voltage Line Frequency	100 to 250 VAC 50 to 60 Hz
	Power (Watts)	All ports empty All ports in use at 251 mA each	25 Watts 35 Watts

SPECIFICATIONS *(continued)*

64-bit/66-MHz Fibre Channel Host Adapter	**Protocol**	Fibre Channel Arbitrated Loop	
	Data Transfer Method	PCI Model	64-bit/66-MHz PCI bus-master
	Maximum Transfer Rate (on Fibre Channel Arbitrated Loop)	100 MB/s	
	LED Indicators on Slot Panel	GBIC Transmit Status GBIC Receive Status	
Fibre Channel Host Adapter	**Protocol**	Fibre Channel Arbitrated Loop	
	Data Transfer Method	PCI Model	32-bit/33-MHz PCI bus-master
	Maximum Transfer Rate (on Fibre Channel Arbitrated Loop)	100 MB/s	
	LED Indicators on Slot Panel	GBIC Transmit Status GBIC Receive Status	
Multi-Mode Fibre Channel Cables Kits	**Cable Type**	50 micron multi-mode fiber	
	Available Cable Lengths	6.5, 16.25 and 48.75 ft/2, 5, 15, 30 and 50 meter	
Fibre Channel Troubleshooting Kit	**FC Troubleshooting Guide**	Comprehensive guide which describes the components of the FCSS, the functions of the Fibre Fault Isolation Utility and provides flowcharts for troubleshooting the FCSS	
	Serial Port Cable	Enables out-of-band User Diagnostics via a laptop or PC to test FC Array & Array Controller functionality and FC link integrity (via Loopback Cable and Duplex Adapter)	
	PC Companion Cable	Enables out-of-band user diagnostics via a PC Companion to test FC Array Controller functionality	
	FC Short Wave Loopback Cable	Enables complete FC link testing with the FC Array Diagnostic Utility	
	FC Duplex Adapter	Enables FC cable testing with the FC Array Diagnostic Utility	
	Gigabit Interface Converter Cleaning Kit	Enables GBIC and FC Cable optics cleaning	

RELATED OPTIONS

Hard Drives	18.2-GB Pluggable Ultra 3 Universal Hard Drive, 15,000 rpm (1")	188122-B22
	9.1-GB Pluggable Ultra 3 Universal Hard Drive, 15,000 rpm (1")	188120-B22
	36.4-GB Pluggable Ultra3 Universal Hard Drive, 10,000 rpm, (1″)	176496-B22
	9.1 -GB Pluggable Ultra3 Universal Hard Drive, 10,000 rpm, (1″)	142671-B22
	18.2-GB Pluggable Ultra3 Universal Hard Drive, 10,000 rpm, (1″)	142673-B22
	18.2-GB Pluggable Ultra2 Universal Hard Drive, 7200 rpm, (1″)	128418-B22
	18.2 -GB Pluggable Ultra2 Universal Hard Drive, 10,000 rpm, (1″)	388144-B22
	9.1-GB Pluggable Ultra2 Universal Hard Drive, 7200 rpm, (1″)	328939-B22
Cabling	GBIC-SW Connector Kit (2 ea.)	234459-B21
	GBIC-LW Connector Kit (2 ea.)	340412-B21
	2 m Multi-Mode Fibre Channel Cable	234457-B21
	5 m Multi-Mode Fibre Channel Cable	234457-B22
	15 m Multi-Mode Fibre Channel Cable	234457-B23
	30 m Multi-Mode Fibre Channel Cable	234457-B24
	50 m Multi-Mode Fibre Channel Cable	234457-B25

RELATED OPTIONS *(continued)*

Other	Redundant Host Adapter Failover Software Kit for Windows NT 4.0	174681-B22
	SecurePath 3.1 for Windows 2000	213076-B21
	RA4000 Redundant Controller	223187-B21
	RA4000 Redundant Power Supply (The RA4100 Array ships standard with a redundant power supply.)	224206-001
	FC-AL Switch 8	177862-B21
	FC-AL Switch 3-Port Expansion Module (Required to expand the FC-AL Switch 8 to 11 ports)	177863-B21
	FC Switch 8 EL	176219-B21
	Fibre Channel SAN Switch 8-EL - Bundle	253723-001
	FC Switch 16 EL	212776-B21
	Fibre Channel SAN Switch 16-EL - Bundle	253740-001
	SAN Switch 8	158222-B21
	Fibre Channel SAN Switch/8 (supports Quckloop) - Bundle	253704-001
	SAN Switch 16	158223-B21
	Fibre Channel SAN Switch/16 (supports Quckloop) - Bundle	253705-001
	Fibre Channel Storage Hub 12	295573-001
	Fibre Channel Storage Hub 7	234453-001
	RA4100 Rack to Tower Conversion Kit	154253-B21
	Fibre Channel Storage Hub 7 Universal Rack Mount Kit	136127-B21
	Fibre Channel Array Controller 64-MB Cache Upgrade Kit	262398-B21
	Fibre Channel Troubleshooting Kit	234468-B21
	Compaq 9142 Rack	120663-B21, -B22, -B23
	Compaq 9136 Rack	120664-B21, -B22, -B23
	Compaq 9122 Rack	120665-B21, -B22, -B23
	Compaq 7142 Rack	165753-001

COMPATIBILITY

Servers

ProLiant DL320
ProLiant DL360
ProLiant DL380
ProLiant DL580
ProLiant 8500
ProLiant ML330
ProLiant ML350
ProLiant ML370
ProLiant ML530
ProLiant ML570
ProLiant ML750
ProLiant 8000
ProLiant CL380
ProLiant CL1850
Any Intel-based server (Multi-platform Intel-based servers are only supported when running Microsoft Windows NT, Windows 2000 NetWare, Linux and SCO operating system.)